Tim Phillips [00:00:09]:

Welcome to our second episode of VoxTalk's Climate Finance. My name is Tim Phillips, and welcome back also to my co-host, Alissa Kleinnijenhuis. Alissa, hello again.

Alissa Kleinnijenhuis [00:00:20]:

Hi Tim.

Tim Phillips [00:00:24]:

When we talk about climate finance, our minds immediately jump to how we deal with the risks of climate change. But today we're instead going to focus on the economic risks of biodiversity loss. Now, if you listen to our first episode, and if you didn't listen to it, why did you not? You can still find it. Stefano Giglio pointed out that climate change will have an impact on the natural environment, but also that the natural environment will affect the rate of climate change. So is it possible to use private capital to finance biodiversity conservation and restoration? And what can that achieve? In short, is there a market for biodiversity?

Alissa Kleinnijenhuis [00:01:11]:

In today's episode, we have the pleasure of hosting Johannes Stroebel and Caroline Flammer. Johannes Stroebel is a David S. Lupe professor of Finance at New York University's Stern School of Business, and Caroline Flammer is a professor of International and Public Affairs and of the Climates at the School of International and Public Affairs, SAIPA, and at the Columbia Climate School. Welcome, Caroline. Welcome, Johannes.

Caroline Flammer [00:01:36]:

Thanks so much for the invitation. Great to be here.

Johannes Stroebel [00:01:38]:

Great to be here.

Tim Phillips [00:01:43]:

Caroline. Why should investors care about biodiversity?

Caroline Flammer [00:01:47]:

The short answer is for multiple reasons. So several organisations have highlighted that protecting biodiversity is really critically important and urgent, not only for the planet and our

own health and well being, but also for the world economy. And just to give you a couple of examples, the WWF, for example, has issued a Code Red alert for humanity, given that several species have declined by about 70% since the 1970s. Relatedly, the United Nations, for example, highlights how deeply intertwined the climate crisis is with the biodiversity crisis. And essentially, in order to address the climate crisis, there's no way around it. But we need to address the biodiversity crisis. And even if investors don't care at all about biodiversity, even if they don't care about the pandas, the whales, the pumas, the krill in the oceans, they will care about understanding that over 50% of the global GDP is dependent on nature and ecosystem services it provides.

Alissa Kleinnijenhuis [00:02:55]:

Johannes, is biodiversity risk currently reflected in asset prices?

Johannes Stroebel [00:03:01]:

First thing we want to spend a bit of time talking about is the various ways in which firms might be affected by risks related to biodiversity loss, because only when firms are affected are then asset prices whose value depends on the cash flows from firms affected. So when I think about that question, I think about two broad categories of risks. The first one is what we call physical risks from biodiversity loss. These would be effects on firms that use biodiversity as an input into the production function. As Caroline has just mentioned, overall, a lot of economic activity draws upon biodiversity. And when you think about industrial sectors, there's many of them, agriculture, as sort of a very prominent one, that use biodiversity as an input into their production. And so naturally, the loss of biodiversity would negatively affect those types of firms. The second category of risk is what we call transition risks. So these would be firms whose activities affect biodiversity, and therefore, who will be affected by any types of regulations that come in that protect biodiversity. So here you might, for example, think about the shipping sector, which has effect on coastal sea life, etcetera, and therefore, any types of regulation to protect that biodiversity would affect the shipping sector. So both physical and transition risks related to biodiversity loss can affect firms and therefore might end up affecting asset prices.

Alissa Kleinnijenhuis [00:04:22]:

So what are the ways in which one could explore whether biodiversity risk is reflected in asset pricing?

Johannes Stroebel [00:04:31]:

In standard asset pricing, empirical asset pricing, we have two ways that we can address that question. So the first one, maybe the more traditional one, is to try and figure out whether or not firms that are exposed to the risk have higher expected returns. So the idea would be, investors don't like risks. And so in order for investors to be willing to hold stocks or other assets that are

exposed to the risks, those risks have to deliver a higher expected return. And so the way that you would try and do this in practice, is you would sort firms on their exposure to these types of risks. So you would ideally go long those firms that are most exposed to the risk, maybe again, those in the shipping industry or those in the agriculture industry, and you would go short those firms that are not so exposed to the risk. And then what you would ideally want to see is whether or not a portfolio that overweights those firms that are exposed to the risk has a higher expected return, again, to compensate investors for taking on that extra risk that comes from the exposure to these biodiversity risks. The problem with that approach is that we cannot really ever observe expected returns in the data. We only observe realized returns. And so what we quite often do in finance is we equate the two. We say, well, we don't know what expected returns are, but over long periods of time, realized returns should equal expected returns. And so what you would then try and do is you would try and see whether or not the returns of firms that are more or less exposed are higher than those of the average firm in the market. The problem with doing this approach is that estimating realized returns is actually very, very hard, in particular, measuring average realized returns. And it's particularly hard during periods when, say, the attention that people pay to biodiversity risk or something like that moves around. And so when we thought about this research question, we decided that this first approach, just trying to figure out whether the returns of these firms are higher on average or lower on average than the market, wasn't going to be a very successful path to go. And so instead, what we did is we went along the second type of approach. The idea here is to say, do we see that in periods when we get bad news about these risk realizations, do we see that firms that are exposed to those risks underperform? That's sort of a necessary condition for the risks to be priced in markets. Think of a portfolio of stocks that is particularly overweighting those firms that are exposed to the risk. Can we see this portfolio underperform on average, in periods when we learn negative things about biodiversity risk realizations? The benefit of this approach is that you only need to estimate covariances, correlations, which is much, much easier to do statistically in small samples than estimating means.

Tim Phillips [00:07:03]:

It's still not entirely straightforward, is it? If we get into the details of this, Johannes, first, you're going to have to need to create an index of biodiversity risks. So how do you go about that?

Johannes Stroebel [00:07:16]:

Yes, you're exactly right. So the challenge that we face is now to figure out, well, when are these periods when we get bad news about biodiversity risk realizations? For example, take transition risks. That could be identifying periods when we learn about the Endangered Species Act getting either more tight, in which case it would be a negative risk realization from the perspective of exposed firm, or maybe less tight, in which case this would be a positive risk realization. And so to measure these systematically, what we try and do in this paper is to take the word news serious. And what we try and do is we study the coverage of biodiversity related risks and news about these risks in the New York Times just as one representative source of

news. And so what we try and do is to use tools from natural language processing to measure when the New York Times reports about either positive or negative biodiversity risk realizations. Again, then with the idea of trying to figure out whether in those periods, stocks that are exposed to these risks happen to do particularly badly.

Alissa Kleinnijenhuis [00:08:14]:

So there's a second part that you also would have to estimate. That is, how would you measure firms exposure to these biodiversity risks?

Johannes Stroebel [00:08:24]:

Yes, that's right. So even when you have that aggregate time series, right, you say, well, in this period, we got bad news about biodiversity risks. In this period, we get good news. What you still need to figure out is whether or not firms that are more exposed do better or worse across these different periods. So what does it mean to be more exposed? Well, you could think about either being more exposed to the physical risks. These, again, would be firms that use biodiversity as an input into production, as an example, or the transition risks. These would be firms that affect biodiversity and therefore would be primarily affected by regulations related to biodiversity loss. We're going to have two approaches to measuring these exposures. The first one is going to be looking at actually self declared risk exposures by firms. So in the US, firms have to declare in their ten case statements a whole range of material financial risks to their investors. They will have to go and tell their investors that they are exposed by either physical biodiversity risks or transition biodiversity risks. And so we try and process these ten case statements to try and learn which firms themselves declare those types of risk exposures to their investors. The second way of trying to measure which firms, or in that case, which industries are exposed, is to try and elicit it through a survey of investors. So we ran a pretty large scale survey of investors, regulators, and academics who think about biodiversity, and we asked these investors to rank a whole range of industries based on their exposures to both physical and transition biodiversity risks. We get a pretty high correlation between the types of industries where firms self declare their exposures to various types of biodiversity risks and the perceptions of investors as elicited through the surveys of the types of industries that they think are exposed to the risks.

Tim Phillips [00:10:05]:

Okay, so, Johannes, don't keep us in suspense. If there is agreement about which firms and industries are exposed, which ones are most exposed to these risks?

Johannes Stroebel [00:10:15]:

It’s a good question, and it, I think, tells us more about these mechanisms through which biodiversity loss does affect economic activity. Across the two types of risk category, firms in the

energy sector, firms in the utility sector, firms in real estate, are all firms that, on average, report to be more exposed to certain times of biodiversity risk. There's some interesting nuance. So, for example, energy firms or real estate firms largely talk about their exposures to biodiversity transition risk. Their activities affect biodiversity. And so, again, regulations to protect biodiversity reduced biodiversity loss will make it harder for firms in those industries to operate. On the other hand, firms in the food and beverage sector, for example, or firms in the biotech sector that potentially use biodiversity as an input, those firms report to be largely affected by physical biodiversity risks. So, again, you could start using the industry rankings to learn about the mechanisms and the economic channels through which biodiversity risks matter, and to help others who work in the space or are interested in working in the space, we've released all of our exposure measures on a website, biodiversityrisk.org, where you can download them again, both at the firm and the industry level, to use them as an input into your own work. But also, even before we do that, to just help us understand why it is that sector A might be more affected than sector B.

Alissa Kleinnijenhuis [00:11:34]:

So what do you find? Are biodiversity risks reflected in asset prices or not?

Johannes Stroebel [00:11:41]:

We find pretty strong evidence that they are already reflected in asset prices. So again, explicitly what we find is that in period when we get negative news about risk realization, so, for example, in periods when we hear that the Endangered Species Act is tightened through regulatory activity or something like that, portfolios that are overexposed to firms that have transition risk exposure, biodiversity transition risk exposure, those portfolios will underperform in periods when we learn that transition risk realizations occur. And so, again, that's a necessary ingredient into those types of risks being priced already.

Tim Phillips [00:12:19]:

Are you sure, Johannes, that you are capturing biodiversity risks specifically here, and it's not just acting as a proxy for a sustainability type of risk in general?

Johannes Stroebel [00:12:31]:

Yeah, I think that's a good question. And we spent a lot of time thinking about this. We're in particular trying to figure out the extent to which this risk is different from, say, climate risk. Biodiversity loss and climate change are obviously interrelated in a whole range of ways. Biodiversity loss probably causes more climate change through the loss of tropical rainforests, et cetera, and climate change leads to biodiversity loss. So the two types of risk, obviously not independent of each other. And yet we think that when you look, for example, at these, across firm exposures to the risk, there's really interesting economic differences between the two. So,

to me, the most salient example of this is when you look at firms that produce renewable energy. So these would be firms in the utility sector who might produce energy either through solar or wind or something like that. When you think about these firms from a climate risk exposure perspective, you would think that those are firms that should benefit from transition risk realizations in the climate space. Those types of transition risk realizations would, for example, involve a carbon tax, which should increase the relative competitiveness of solar, wind, hydropower, et cetera. When you think about biodiversity transition risk realization, these are actually some of the most exposed firms. These are firms that would suffer from tightening of regulation around biodiversity loss. Why? Well, because there's lots of concerns that offshore wind farms have negative effect on whales, that hydropower stations have negative effects on migrating fish, that onshore wind kills migrating birds, that solar has a whole range of land use requirements that quite often run into opposition from local activists concerned about biodiversity loss. So the same type of firms that would benefit from transition risk realizations in response to mitigating climate change would actually suffer, and it would be more expensive for them to operate in response to regulatory interventions to stop biodiversity loss. So this is just one example of an important industry that highlights while biodiversity loss and climate change are interrelated in interesting ways, when you think about risk exposures, it can be very different sectors of the economy that are exposed.

Alissa Kleinnijenhuis [00:14:42]:

So, Caroline, what intergovernmental mechanisms can we use to protect and restore biodiversity and reduce these biodiversity risks?

Caroline Flammer [00:14:52]:

If we think about nature and ecosystem services, one challenge is that these are typically provided as a so called public good, and we know that what it means a public good, is that the consumption of this public good is nonrival. That means those that consume this public good but are unwilling to pay for it, they cannot really be excluded from its consumption. And so this likely leads to, on one hand, undervaluation, but also the under provision of this public good. Now, there are different governmental and intergovernmental measures that we could take. And so, on one hand, there are intergovernmental measures, and I'm thinking here, for example, about the Convention on Biological Diversity and other global treaties. On the other hand, we have governmental measures that aim to regulate either the quantity of natural capital, for example, through the establishment of protected areas, technology standards, the introduction of cap and trade programs, etcetera, or they aim to regulate the price of natural capital, be it through tax incentives or subsidies, in order to encourage more sustainable production and consumption patterns. From a theoretical point of view, these would basically be first best solutions. From a practical point of view, the challenge is that they are relatively difficult to implement, and so this leads to the role of biodiversity finance. So to what extent can biodiversity finance help mitigate this issue of a public good?

Tim Phillips [00:16:15]:

What is it about the difficulty of achieving first best with these conventions and treaties and regulations? That means that we do need biodiversity finance, Caroline?

Caroline Flammer [00:16:24]:

There's no global government.

Alissa Kleinnijenhuis [00:16:27]:

That's a big challenge.

Caroline Flammer [00:16:28]:

Let me stop there. We could fill an entire 2 hours, if not more, about that topic itself.

Alissa Kleinnijenhuis [00:16:35]:

So for private finance to work, biodiversity must have some monetary value as well. What could the monetary value be that biodiversity has to offer?

Caroline Flammer [00:16:47]:

From an investor's point of view what do you care about? Well, on one hand, you care about the risk. And Johannes already talked quite a bit about the risk exposure, but you also care about returns. And let me briefly touch on both of these aspects. Okay, so if we look at returns, what are these returns? Well, the typical monetization mechanism of natural capital basically includes the transformation of natural capital. Think about, for example, logging and mining. But how on earth do you achieve a financial return when instead of transforming natural capital, you are supposed to actually protect natural capital? Right. So at first it might make you wonder, how do you even make money out of the protection of biodiversity? This seems to be puzzling at first. It's not that tricky because the key lies essentially in the bundling of a public good with a private good, where the protection of the public good increases the value of a private good. So what does this mean? Let's look at, for example, agriculture. So by engaging in regenerative agriculture, this improves the soil quality, which potentially optimizes the harvest and the quality of the produce, allowing the farmer to potentially increase the price, especially if their produce is certified. Here you bundle a public good, which is nature, together with a private good, which is the agricultural produce that the farmer produces. And so by protecting nature, by engaging, for example, in shade grown coffee farming, it allows the coffee farmer to actually achieve a higher price. Let me give you a couple of other examples, because I think it's important to understand that intuition of how nature allows you to gain economic value. So, for example, when we look at forests, by protecting forests, this can enhance ecotourism, which allows hotels around that

forest to charge higher prices, and in addition to provide tour guide services. Again, this is direct economic value that can be achieved by protecting nature. And the last example I'm going to give you is, for example, I live near Central park in New York City. So by protecting or by conserving Central park, it allows to increase the value of the real estate around it. Okay? So again, you bundle a public good, which in this case is the park, with a private good, which is the real estate. And so by protecting the public good, it increases the value of the private good. Now, this is the direct financial return an investor can achieve by investing into these conservation projects. For example, in addition to the direct financial returns, investors can also achieve indirect financial returns, for example, through biodiversity credits or carbon credits. Again, you can see this deep intertwinedness between addressing the climate crisis and the biodiversity crisis. Essentially what we need to realize is that nature provides a natural carbon sink, okay? And so essentially, by protecting nature, you can also obtain, for example, carbon credits. In addition to these direct financial and indirect financial returns, there are biodiversity returns. Okay, so some investors will also care about the potential value of protecting biodiversity by itself, be it the flora or the fauna. So you can argue that traditional investors, who may not care at all about biodiversity, they will care about the direct and indirect financial returns that they can achieve by investing in these projects. Impact investors, they will also assign some value to the biodiversity return they can achieve. Now, in addition to these returns, investors care about the risks. What we need to understand is that when it comes to nature, many investors feel under informed about the potential opportunities and risks that such investment entail. And so what has kicked in, in practice, is blended finance, where public funding, be it development funding, so development finance institutions or philanthropic organizations, for example, the Nature Conservancy or the WWF, would provide concessionary funding that is blended together with private capital investments in order to subsidize, but also derisk such investments. And so this obviously makes it more appealing for private capital investors to come in because it de facto derisks their investments. And I would also like to highlight that, besides these risks and returns of the actual investments, protecting biodiversity also helps decrease the investors exposure to systemic risks. As I mentioned before, over 50% of the world's GDP is dependent on nature and the services it provides. Taking this into account, and in addition, understanding that the biodiversity Crisis, climate Crisis are deeply intertwined, you realize very quickly that by actually investing our capital, accordingly, it also helps decrease the exposure to systemic risks.

Tim Phillips [00:21:31]:

We know that biodiversity finance exists because I read your paper and you've reviewed some deals, some actual deals that have happened on this, but this is private finance. So where'd you get the data about this?

Caroline Flammer [00:21:44]:

If you read my paper, you also know I'm not allowed to disclose it to you. Sorry about that, Tim. We obtain it from what we call a biodiversity investment manager. Again, I'm not allowed to

disclose the name to you, but it is a leader in, more broadly, the sustainable finance space.

Alissa Kleinnijenhuis [00:22:01]:

Which of those deals use purely private capital?

Caroline Flammer [00:22:05]:

When you look at what kind of natural asset types there are, so this includes land, which includes agriculture, forestry, urban parks, wildlife protection, natural parks and genetic resources. On the other hand, we have sea, which includes, for example, watersheds, coastal ecosystems, fisheries and oceans. Now, when you look at blended financing deals versus pure private capital investments, you can really see both types of financing structures for all types of assets. I think the key question is, what is the expected financial returns of these projects, and what is the projected expected biodiversity return. If a project on its own achieves a relatively high expected financial return, you can argue there is no need for blending. You can just invest private capital into such a project. But if, let's say, the expected financial return is not that high, which would make it appealing for private capital investors to come in, may be able to make such a deal nevertheless attractive to private capital investors by derisking and subsidizing it through blending. By providing, for example, concessionary funding, development finance institutions can help serve as a catalyst to crowd in more private capital investments. And so what you often see is if you then take into account these kinds of risk adjusted returns, they are appealing after the blending. In other words, if there is high potential for expected biodiversity return, it may actually make sense to engage in this complicated structure of blended financing because it helps you crowd in private capital investments.

Alissa Kleinnijenhuis [00:23:43]:

So what have the risk adjusted return profiles of the biodiversity deals taught you about how these deals should be structured in the future, and which type of deals can make use purely of private capital, and which deals should be using blended finance?

Caroline Flammer [00:24:01]:

One question is, what's the expected financial return? If it's attractive enough, there's no need for blending. In other words, only deals above a certain risk return threshold appeal to private capital investors. You can make these deals more attractive through blending. The question is, is it needed? It also suggests that blending can serve as an important tool to crowd in more private capital investment. Now, what our results also suggest that there is a three dimensional risk financial return biodiversity return tradeoff frontier. In other words, the biodiversity return needs to be sufficiently favorable for blended financing to be used. That also means there are limitations to the use of private capital investments, be it through blending or pure private capital investments. There are, for example, instances; you won't be able to bundle public good

together with a private good. So in those instances, there's no way you can attract private capital investment. So all we have left is potentially governmental measures and intergovernmental measures or philanthropic funding. So I think we need to be clear that private capital investments are not going to be a silver bullet here. It's an important tool in the toolbox to protect biodiversity, but it will unlikely be a substitute for the implementation of effective public policies in addressing the biodiversity crisis.

Tim Phillips [00:25:30]:

Johannes, we've been talking about biodiversity, which is a buzzword we're hearing a lot about at the moment. Is it the right term to use? Should we not be thinking about what economists have always called natural capital?

Johannes Stroebel [00:25:42]:

I think it depends what it is that you want to achieve. As you mentioned in the introduction, there's lots of dimensions of the interaction between sort of economic activity and the health of our planet. Climate change is one of them. Biodiversity and the loss of biodiversity is another. And then there's this broader category. Think about natural capital or nature related financial risks, which would also include things like water scarcity as just one example of a really important topic that I don't think naturally falls under the biodiversity umbrella. Now, the reason that my work, and I suspect Caroline's work, is focusing on biodiversity is because that's already a very broad set of themes and so, you know, it just gets more and more complex as you broaden that umbrella. I would say it really depends on the question that you want to answer. From the perspective of someone trying to do academic research, sometimes narrowing in on a subset of a much broader topic allows you to generate a set of questions that you actually can get a handle on. But I suspect that water scarcity is equally important as biodiversity loss in terms of its effects on economic activity. And so my sense is that other people, or maybe us, should be also doing more work on these other dimensions. But my fear is that as you broaden it out further and further and talk about natural capital in its entirety, it becomes so unwieldy as a topic to think about that it's impossible to make any progress. And so I think chipping away bit by bit at the biodiversity and the water scarcity and the climate change angle will allow us to make better progress on the knowledge generation side.

Alissa Kleinnijenhuis [00:27:17]:

Yeah that makes a lot of sense. Johannes, the only rebuttal perhaps I would offer is that many people are speaking of the twin crises of climate change, biodiversity loss, whereas I would say it's actually more broadly the twin crises of climate change and the loss of natural capital. And I think if biodiversity becomes too much of a buzzword, people forget it's actually the broader term that also matters. So, in this context, we know that forests are major carbon sink. For some countries, such as Brazil, the biggest contribution they could make to tackling climate change is, in fact, to preserve their forests. So the Brazil Amazon rainforest is really a global public good

that it offers to the world. And this is, in fact, not necessarily a biodiversity global public good. It's a natural capital public good as a carbon sink. Yet the world is not yet paying Brazil to preserve its rainforest. If you think about preserving the Amazon rainforest, can private finance play a role in this?

Caroline Flammer [00:28:16]:

The short answer to your question is, yes, it can. But is it the only one that can play a role in this? Unlikely. So let me take a step back and look at the evolution of biodiversity finance. Historically speaking, when we look at how the protection of biodiversity has been funded, it has been historically funded through public funding that includes, for example, debt for nature swaps, the official development assistance, sovereign biodiversity bonds. You might have heard of sovereign ocean bonds or the rhino bonds to, for example, protect the black rhino population in South Africa. It includes payments for ecosystem services, biodiversity offsets, etc. In addition, we have philanthropic giving, be it by private donors, but it also includes, for example, organizations such as the Environmental Defense Fund, the Nature Conservancy, the World Wildlife Fund. Despite these funding sources, we face an enormous financing gap. We face an enormous financing gap with respect to the mitigation of the climate crisis. We also face an enormous financing gap with respect to biodiversity and social inequality and poverty, and, and, and. And so the key question is, how can we crowd in more capital to close these financing gaps and to efficiently protect, let's say, in this case, nature and the ecosystem services it provides? Can private capital investments play a role? Absolutely. But is it going to provide the silver bullet? No.

Alissa Kleinnijenhuis [00:29:49]:

Thank you so much, Caroline. We hope you enjoyed this episode of VoxTalks Climate Finance. I would like to thank my co-host, Tim, and also would like to thank our guests, Caroline and Johannes.

Tim Phillips [00:30:03]:

You might also want to read the research, so I better tell you where to find it. The paper Biodiversity Risk. The authors are Stefano Giglio, Theresa Kuchler, Johannes Stroebel and Xuran Zeng. It is NBER working paper 31137 and you can find the measures of biodiversity risk exposure at biodiversityrisk, all one word, .org. Biodiversity Finance. The authors, Caroline Flammer, Thomas Giroux and Geoffrey Heal. Is NBER working paper 31022. Read it as closely as you like. You won't find out where they got that data. I'm going to ask Caroline about it after we finish recording.

Alissa Kleinnijenhuis [00:30:50]:

Stay tuned for the next episode of VoxTalks Climate Finance, where we ask the question, what

is or what should be the purpose of the company in the era of climate change?